

2007 ANNUAL EFFICIENCIES REPORT

Utah Department of Transportation

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SAVINGS TO THE PUBLIC

4500 SOUTH BRIDGE OVER I-215

Savings: \$4,200,000

Efficiency: Reduced traffic delays on I-215 from nine months to three days

The bridge crossing I-215 at 4500 South on the east side belt route was deficient and in need of replacement. If conventional construction methods were used many lane closures would have been required on I-215 and a permanent closure of 4500 South for a duration of 5 months. The Department opted for a rapid bridge construction technique in which the bridge was built alongside of I-215 and moved into place. This method only required one weekend

closure of I-215 and a ten-day closure of 4500 South.

This project eliminated delays for about 67,000 commuters each day over the five-month period. This is more than ten million trips that would have been impacted by delays. The University of Utah Traffic Lab estimated that the savings to the traveling public was more than \$4,000,000. Additional cost to the project for the bridge move was approximately \$800,000. The

Department received extra funding from the Federal Highways for Life grant to demonstrate the technology. The total savings for this project is \$4,200,000.



CONTINUOUS FLOW INTERSECTION

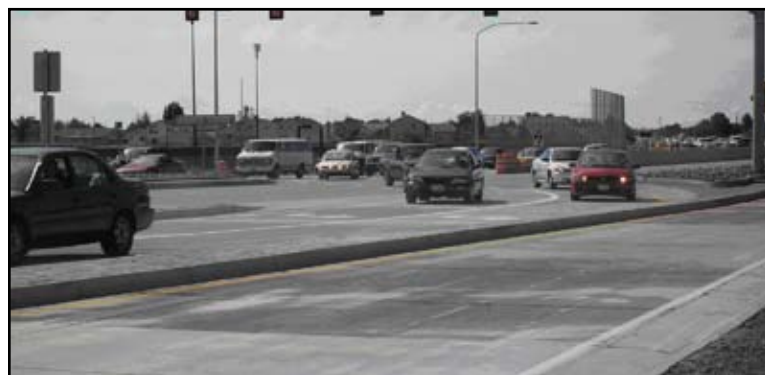
Savings: \$5 million annually

Efficiency: Reduced congestion using innovative intersection design

East-west travel in Salt Lake County is a significant transportation issues we face. A new design that allows more traffic to flow through an intersection was recently constructed at 3500 South and the Bangerter Highway. The design allows for the left-turn phase from Bangerter Highway to 3500 South to be relocated. To the far left of the intersection, left-turning vehicles cross oncoming traffic at an additional signal upstream of the intersection signal. This allows vehicles to make the left turn at the same time as traffic is crossing 3500 South. The

design eliminates one traffic phase at the intersection, significantly improving traffic flow.

A full reconstruction with a typical interchange design has been estimated at \$50 million. The reconstruction strategy could have significant impact on the community and local businesses. Use of the Continuous Flow Intersection has delivered the desired result, at a lower cost, and lower user impact. The annual benefits on Bangerter Highway and 3500 South are estimated at \$5,000,000.



OPERATIONAL SAVINGS

HYBRID TUNGSTEN CARBIDE STEEL/ RUBBER SNOWPLOW BLADE INITIATIVE

Savings: \$648,000 one year

Efficiency: Increased value for snowplow blades

Replacing worn-out snowplow blades accounts for nine percent of UDOT's total snow removal costs. In FY 2006 snowplow blades cost about \$1.5 million. The current standard blade used by UDOT consists of tungsten carbide cutting inserts brazed into a slotted steel blade.

In FY 2007 a different type of blade was field tested to determine if higher unit cost blades would provide better wear. The new blades provided five times as much wear life as our traditional blades. These high-tech blades cost about three times as much as steel blades.

An extensive test will be undertaken this year to determine the effect of the new blades on paint line longevity,

truck vibration damage reduction, salt use, and level of effort required to keep roads open and free flowing.

When blade cost, blade replacement labor cost, and truck availability costs were considered, it was determined that converting to these new blades for one year will result in a benefit-cost ratio of 2 to 1. Estimated cost avoidance for the 2007-2008 snow season is \$648,000, based on installing 330 sets of the new blades.

In addition, the time saved in changing plow blades will be equivalent to adding two additional trucks to our statewide snow removal fleet.



AUTOMATED ROADWAY LITTER AND DEBRIS PICKUP INITIATIVE (Road Rake)

Savings: \$200,000 annually

Efficiency: Automate litter pickup and eliminate crews

Picking up debris and litter from road shoulders is time consuming and presents crash risks to motorists and UDOT crews. Extensive installation of solid median barrier and shoulder barrier adds to the litter problem because what falls on the pavement stays there. A two-person crew can pick up about one mile of large debris per hour in urban areas.

In 2007 a new type of mechanical trailer was rented and tested in the Provo, Salt Lake, and Ogden regions. The test was very successful. Not only was large debris removed, but smaller debris was picked up as the machine was towed behind a UDOT truck at fifteen miles per hour. Using the device a single person is able to pickup eight miles of shoulder in 90 minutes. All crews that used the device

recommended immediate purchase of a unit for their region.

Currently UDOT pays \$300 per load landfill fee for the mixed sweeper tailings now picked up because of tire casings and metal in the mix. The road rake will pick up tire shreds, metal, and virtually all other road debris, thus making our sweeping tailings entirely rock and grit that can be used for shoulder work or as fill. Savings are from reduced dump fees and sweeper maintenance costs. Also substantially reduced crew time is needed for debris pickup, thus freeing staff for other higher priority maintenance and construction activities. Total savings is more than \$200,000 per year for this program.



WEATHER OPERATIONS PROGRAM

Savings: \$2 million

Efficiency: Improved snow removal operations and better construction timing

The Traffic Management Division provides weather forecasting support to all of UDOT's maintenance stations to help improve winter maintenance. This program was begun in the Salt Lake Region and has been expanded this year to cover all UDOT Regions. The Division employs one full-time meteorologist and uses a contract meteorology service to provide 24-hour-a-day coverage during the winter months.

This service is unique in several respects:

- a) weather forecasts are customized for each of UDOT's 88 maintenance stations throughout the state based on the terrain and elevation in each maintenance area,
- b) forecasts emphasize the impact of precipitation and temperature on road surfaces to aid in the application of effective winter maintenance treatments,
- c) the weather operations section uses

the technology available at the Traffic Operations Center to closely monitor weather and road conditions in real time and to communicate current conditions to snow plow operators.

In 2007, the Western Transportation Institute of Montana State University completed a research evaluation of the Traffic Management Division's weather operations program. This study found that the program was unique among DOTs in the United States. The study found that the program had a cost/benefit ratio exceeding 10 to 1, and resulted in savings to UDOT's winter maintenance costs of approximately \$2 million. On the basis of this study, UDOT was awarded a national "Best of ITS" award in the category of "Return on Investment".



SOLAR POWER AT MAINTENANCE STATIONS

Savings: Reduction in power use by 15%

Efficiency: Use solar power to reduce use of electricity

A solar power system was installed at the Murray Maintenance Station. We have observed the solar power system to offset the shed use by about 15%. This concept has been very successful and other installations are planned. A solar project for the Moab maintenance complex is in the planning stage. In early spring of 2008, a wind turbine will be installed at the Milford maintenance station.



All projects are being partially funded with the help of the Utah Geological Survey (UGS) grant money. This program is helping state agencies offset the up-front cost of alternative energy systems.

OPERATIONS FUNCTIONS IN THE REGIONS

Savings: \$1 million+

Efficiency: Optimal use of maintenance and construction personnel

In August of 2006, Construction and Maintenance functions were combined into a single Operations function at the Region level. Region District Engineers now oversee combined maintenance and construction activities and share resources to make the overall system work better.

Through cross-training and technician time optimization, the number of technician positions needed to complete construction and maintenance activities has been reduced. This initiative has resulted in additional savings in the construction budget that has been used for maintenance activities.

GROOVED WATER BASED PAINT

Savings: \$95,000 expected

Efficiency: Extend the life of inexpensive, nondurable paint

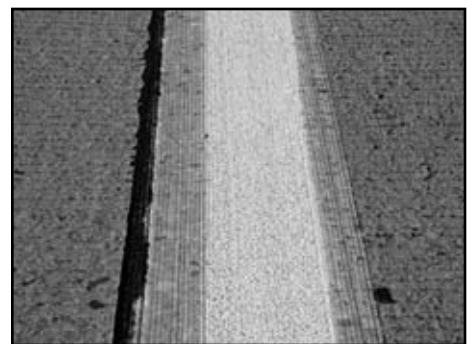
The Pavement Markings Manager from UDOT's Salt Lake region has been experimenting with various application methods for water based paint traffic striping. Typically surface applied pavement markings are subjected to severe abuse during the winter season due to snow removal operations. The plow blades drag along the pavement surface, and as a result the paint or tape is scraped away from the pavement surface.

Following a pavement marking removal and reapplication project that involved grinding the old lines, it was noticed that the new paint lines were withstanding the abuse of plowing better than areas that had not had the old markings ground off. Ultimately, it was determined that the small amount of grinding done to remove the old pavement markings created a pocket where the new paint was below the plow blades and was therefore able to last longer when compared to previous expected life expectancy.

Water based paint has been improving over the years, and has been proving to be more durable and effective than older versions. When compared to other pavement marking materials, water based is the easiest and most cost effective to apply in the short term. When combined with grooving, it is proving to be a cost-effective, longer-term pavement marking. It is expected that each application will last approximately three years, thus proving to be one of the most cost effective and durable pavement marking processes available.

By comparison, pavement-marking tape typically will last approximately five years. Tape has a unit cost of about \$2.50/foot plus installation costs. The grooved in water based paint has an initial cost of \$0.57/ft and \$0.10/ft for each following application. In a given six year period, the water based paint cost will be about \$0.67/ft, where comparable tape application would have been \$2.50 to \$3.00/ft.

This process has the potential to present cost savings for the department when considering the hundreds of thousands of miles of pavement markings in the system. A savings for this year is estimated at \$95,000.



GAZ-EX AVALANCHE CONTROL SYSTEM

Savings: \$50,000 annually

Efficiency: Advanced avalanche control system is cheaper, safer, more controlled

Gaz-Ex is an avalanche control technology that has been used in Europe, and is starting to gain popularity in the United States. It is installed in the starting zones of avalanches to allow for controlled avalanches. The system involves the ignition of a mixture of propane and oxygen, creating a large force through a tube directed at a precise location, thus creating the avalanche. The system is operated remotely, which is safer than the current method and takes only seconds. In cooperation with the Town of Alta, Alta Ski Lifts and Snowbird, two Gaz-Ex installations have been completed in Little Cottonwood Canyon above the Snowbird Village.

It is important that UDOT be a leader in alternative avalanche control methods because of the inefficiencies associated with the current method of avalanche control, which involves Vietnam-era artillery. A lower overall cost for avalanche control has been achieved by using the new technology. Savings have been achieved in maintenance of old equipment and improved safety of the program.

Little Cottonwood Canyon has the highest avalanche risk of any road in the country. This technology allows UDOT to keep the roads open and safe, and allows the ski areas to continue to prosper and attract skiers worldwide.



USE OF BIODIESEL IN UDOT HEAVY EQUIPMENT

Savings: Cleaner air

Efficiency: Cleaner air by using low emissions fuels

In 2007 UDOT started using bio-diesel in eleven different locations. To date UDOT has utilized 67,000 gallons, which has resulted in a significant reduction in fuel emissions. UDOT hopes to expand this program in the future at more locations.

At this time we are obtaining our bio-diesel from external sources, but would like to begin producing our own. The State owns more than 100,000 acres of

right-of-way to grow drought-tolerant plants that can be converted into fuel. UDOT spends about \$1.7 million each year to mow our right-of-way. A research project is underway to evaluate the feasibility of using the plants in these areas for production of bio-diesel. If successful, we believe that millions of dollars can be saved each year by implementing this program.



